ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR
B.O.D.	BOTTOM OF DUCT
CFM OR §	CUBIC FEET PER MINUTE
CLG	CEILING
CP	CONTROL PANEL
CONDO.	CONDENSATE
DIA.	DIAMETER
DMPR	DAMPER
EF-#	EXHAUST FAN (#)
ELEV.	ELEVATION
ER	EXHAUST REGISTER
E.S.P.	EXTERNAL STATIC PRESSURE
F.C.	FLEXIBLE CONNECTION
FD/AD	FIRE DAMPER WITH ACCESS DOOR
FSD-#	FIRE SMOKE DAMPER (#)
FSR	FIRE/SMOKE RELAY
G.D.	GRAVITY DAMPER
M.E.R.	MECHANICAL EQUIPMENT ROOM
NK CO	NECK CEILING DIFFUSER
N.O.	NORMALLY OPEN
NTS	NOT TO SCALE
R.A.	RETURN AIR
SPEC	SPECIFICATION
SQ.	SQUARE
T.F.	TRANSFER FAN
TM	THERMOSTAT MASTER
T#	THERMOSTAT NUMBER
WMS	WIRE MESH SCREEN

LEGEND

- SUPPLY AIR DUCT
- RETURN AIR DUCT
- DROP IN DUCT ELEVATION
- SPRINKLER HEAD
- VD VOLUME DAMPER
- NEW DUCT, PIPE OR EQUIPMENT UNLESS OTHERWISE SHOWN
- EXISTING DUCT OR PIPE, UNLESS OTHERWISE SHOWN
- EXISTING PIPING TO BE REMOVED
- H ALARM HORN
- D DUCT MOUNTED SMOKE DETECTOR
- S_B SMOKE DETECTOR IN BATTERY ROOM
- S_R SMOKE DETECTOR IN RADIO EQUIPMENT ROOM
- T# THERMOSTAT NUMBER
- M MOTOR

SEQUENCE OF OPERATION

1. NORMAL OPERATION

EF-1 SHALL RUN CONTINUOUSLY TO MAINTAIN A NEGATIVE PRESSURE IN THE BATTERY ROOM. A DUCT MOUNTED AIR FLOW SWITCH UPON ACTUATION (LOSS OF AIRFLOW), SHALL ACTIVATE A LOCAL HORN OUTSIDE THE BATTERY ROOM.

THE FAN IN THE AC UNIT SHALL RUN CONTINUOUSLY. A DUCT MOUNTED AIR FLOW SWITCH UPON ACTIVATION (LOSS OF AIRFLOW), SHALL ACTIVATE A LOCAL HORN OUTSIDE THE RADIO EQUIPMENT ROOM.

THE COOLING COIL OF THE AC UNIT SHALL BE CONTROLLED BY THERMOSTAT T1 (LOCATED IN THE RADIO EQUIPMENT ROOM) TO MAINTAIN THE ROOM TEMPERATURE SETTING.

2. ABNORMAL (HIGH TEMPERATURE) OPERATION

AS DESCRIBED ABOVE, AND:

IF THE TEMPERATURE IN THE RADIO EQUIPMENT ROOM EXCEEDS THE DESIRED MAXIMUM OF 75°F (ADJUSTABLE), THEN THERMOSTAT T3 SHALL ACTIVATE THE TRANSFER FAN TF-1 TO RUN, THUS MOVING AIR FROM THE MECHANICAL EQUIPMENT ROOM, THROUGH THE RADIO EQUIPMENT ROOM, INTO THE PLENUM.

SIMILARLY, IF THE TEMPERATURE IN THE BATTERY ROOM EXCEEDS THE DESIRED MAXIMUM OF 75°F (ADJUSTABLE), THEN THERMOSTAT T2 SHALL ACTIVATE THE EXHAUST FAN EF-2 TO RUN, THUS MOVING AIR FROM THE MECHANICAL EQUIPMENT ROOM, THROUGH THE BATTERY ROOM AND OUT OF THE BUILDING THROUGH ROOF.

3. SMOKE CONDITIONS

IF ANY OF THE THREE SMOKE DETECTORS (CEILING MOUNTED DETECTORS "SR" IN THE RADIO EQUIPMENT ROOM, "SB" IN THE BATTERY ROOM, OR THE AC UNIT'S SUPPLY AIR DUCT DETECTOR "D") SENSE SMOKE, THEN ALL FOUR FAN SHUTDOWN RELAYS FSR SHALL OPEN, THUS CUTTING POWER TO THE AC UNIT AND ALL FANS, AND CLOSING ALL MOTOR OPERATED DAMPERS (FIRE SMOKE DAMPERS) BETWEEN ROOMS (SEE "FIRE ALARM SYSTEM RISER DIAGRAM" ON DRAWING E-811.)

AN ALARM SIGNAL SHALL BE SENT THROUGH THE BUILDING'S FIRE ALARM SYSTEM, AND THREE LOCAL STROBE UNIT/ALARM SPEAKERS SHALL BE ACTIVATED.

IF CEILING MOUNTED DETECTOR "SR" IN THE RADIO EQUIPMENT ROOM OR THE AC UNIT'S SUPPLY AIR DUCT DETECTOR "D" SENSE SMOKE, THEN REMOTE ALARM INDICATOR "R" OR "D" RESPECTIVELY SHALL BECOME ENERGIZED.

IF CEILING MOUNTED DETECTOR "SB" IN THE BATTERY ROOM SENSES SMOKE, THEN REMOTE ALARM INDICATOR "B" SHALL BECOME ENERGIZED.

4. RETURN TO NORMAL OPERATION

BEFORE PUTTING AC UNIT BACK TO NORMAL OPERATION, THE FSD-1 TO FSD-5 SHALL BE MANUALLY RESET TO NORMALLY OPEN POSITIONS, AC UNIT SHALL BE MANUALLY RESTARTED (RESET) FROM THE FIRE CONTROL PANEL.

EQUIPMENT NOTES

1. FIRE SMOKE DAMPER (FSD-1, FSD-2, FSD-3, FSD-4, FSD-5), N.O.

FIRE SMOKE DAMPER SHALL BE A COMBINATION FIRE AND SMOKE DAMPER, FOR INSTALLATION IN 2 HOUR WALL, UL RATED FOR LEAKAGE CLASS II AND MEET NYC LOCAL CODE.

FRAME AND BLADES: 16 GAUGE GALVANIZED STEEL, 6" WIDE OPPOSED BLADES

LINKAGE: CONCEALED INSIDE THE JAMB, 1/2" STEEL OPERATING SHAFT EXTENDING 4 1/2" FROM DAMPER SIDE.

SEALS: STAINLESS STEEL SIDE SEAL

FUSIBLE LINK: 165°F

FINISH: GALVANIZED

OPERATOR: 120 VOLT/1PH/60 Hz, ON/OFF, SPRING RETURN, WITH SPDT AUXILIARY SWITCH

DAMPER SIZE:

24"W X 30"H	FSD-1	WITH OPERATOR MOTOR
24"W X 12"H	FSD-2	WITH EXPLOSION PROOF OPERATOR
27"W X 27"H	FSD-3	WITH OPERATOR MOTOR
12"W X 8"H	FSD-4	WITH OPERATOR MOTOR
8"W X 8"H	FSD-5	WITH OPERATOR MOTOR

FSD SHALL BE SAFE-AIR MODEL 772 WITH OPERATOR MOTOR OR APPROVED EQUAL

2. EXHAUST FAN (EF-1, EF-2)

THE FAN SHALL HAVE ANGLE SUPPORTS FASTENED TO THE CASING AND SPRING VIBRATION HANGERS FOR SUSPENSION FROM 3/8" DIA. ROD HANGERS. THE FAN SHALL HAVE AN INTEGRAL THERMAL OVERLOAD PROTECTION, A LOCAL DISCONNECT SWITCH AND A BACKDRAFT DAMPER.

3. TRANSFER FAN (TF-1)

THE FAN SHALL HAVE A BACKDRAFT DAMPER.

4. AIR-CONDITIONING UNIT (AC-1)

THE AC UNIT SHALL BE A SPLIT AIR CONDITIONING UNIT WITH DIRECT EXPANSION COOLING COIL AND AN AIR COOLED CONDENSING UNIT. THE AC UNIT SHALL HAVE THE FOLLOWING:

- WELDED STEEL FRAME
- 16 GAUGE, GALVANIZED OUTER CASING FINISHED IN ALKYD ENAMEL PAINT
- 2" THICK, 3 P.C.F. DENSITY RIGID FIBER BOARD INSULATION
- 20 GAUGE GALVANIZED INNER CASING
- TWO OF 25 X 16, 2" THICK PLEATED TYPE FLAT FILTERS
- FOUR ROW 25 X 28 DX COOLING COIL WITH ALUMINUM FINS AND EXPANSION VALVE
- CENTRIFUGAL FC CURVE DWDI BLOWER MOUNTED ON RAILING INSIDE THE CASING WITH VIBRATION ISOLATORS.
- SPRING TYPE VIBRATION ISOLATORS
- MIXING BOX WITH 25X32 AND 12X8 DAMPERS
- EVAPORATOR DRAIN PAN SHALL BE STAINLESS STEEL CONSTRUCTION
- 1.5 HP FAN AS DESCRIBED IN AC UNIT SCHEDULE BELOW, WITH STARTER

AC UNIT SHALL BE HORIZONTAL INDOOR AIR HANDLER WITH ROOF MOUNTED AIR-COOLED CONDENSING UNIT.

THE CONDENSING UNIT SHALL BE A COMPLETE PACKAGE UNIT WITH ALL CONTROLS AND VIBRATION ISOLATORS. FACTORY TESTED, AND U.L. LISTED. THE UNIT SHALL HAVE HEAD PRESSURE CONTROL AND OPERATE AT LOW AMBIENT TEMPERATURE DOWN TO 0°F OUTDOOR TEMPERATURE. THE UNIT SHALL HAVE THE FOLLOWING ACCESSORIES:

- LIQUID LINE FILTER DRIER AND SIGHT GLASS
- LIQUID LINE SOLENOID VALVE-MOUNTED
- SUCTION ACCUMULATOR AND FILTER
- HEAD PRESSURE CONTROL

5. THERMOSTATS

THERMOSTAT T1 FOR AC-1 UNIT, SHALL BE WALL MOUNTED, SINGLE STAGE. THERMOSTAT WITH SUBBASE. T1 SHALL BE A HONEYWELL MODEL T7300A WITH 07300B SUBBASE OR APPROVED EQUAL. THERMOSTAT T3 SHALL BE 120 VOLT, SPST, TO BE HONEYWELL MODEL T631C1103 OR APPROVED EQUAL.

THERMOSTAT T2 FOR THE BATTERY ROOM SHALL BE WALL MOUNTED, SINGLE STAGE, 3 WIRE SPDT, EXPLOSION PROOF FOR CLASS I, GROUP B HAZARDOUS LOCATION AND U.L. LISTED, AS MANUFACTURED BY DELTA-THERM CORPORATION MODEL 013-4 OR APPROVED EQUAL. THERMOSTATS SHALL BE WALL MOUNTED AT 60" AFF UNLESS OTHERWISE NOTED.

6. EYE-WASH STATION (SELF-CONTAINED)

PROVIDE A WALL MOUNTED SELF-CONTAINED EYE-WASH STATION TO SUPPLY WATER FOR 15 MINUTES OF FLUSHING AT .4 GALLONS PER MINUTE. THE UNIT SHALL HAVE A TRANSPARENT 13.4 GALLON CONTAINER, HEAVY DUTY, WALL MOUNTED, TO BE BRADLEY MODEL S19-630A OR APPROVED EQUAL.

7. CONDENSATE PIPING

CONDENSATE PIPING SHALL BE TYPE L SEAMLESS COPPER TUBING. INSULATE WITH 1/2" THICK ARMAFLEX INSULATION AS MANUFACTURED BY ARMSTRONG WORLD INDUSTRIES OR APPROVED EQUAL. PROVIDE ADEQUATE PIPING HANGER SUPPORTS EVERY 6 FEET TO MEET NYC PLUMBING CODE (LATEST EDITION).

8. AIR FLOW SWITCH

AIR FLOW SWITCH SHALL BE DUCT MOUNTED TYPE, 120 VOLT A.C., WITH STAINLESS STEEL VANE, ADJUSTABLE VELOCITY RANGE, AND ONE (1) SPDT AUXILIARY SWITCH. IT SHALL BE DWYER MODEL NO. 530 OR APPROVED EQUAL.

9. CEILING DIFFUSERS AND EXHAUST REGISTERS

CEILING DIFFUSER SHALL BE STAMPED TWO-POSITION ADJUSTABLE WITH VOLUME DAMPER AND DEFLECTOR AS MANUFACTURED BY CARNES COMPANY INC. MODEL SFA 24X24 OR APPROVED EQUAL.

EXHAUST REGISTERS SHALL HAVE FIXED FACE BLADES WITH AN OPPOSED BLADE DAMPER, TO BE CARNES MODEL 500 OR APPROVED EQUAL.

10. SPRINKLER REPLACEMENT

REPLACE EXISTING SPRINKLERS (QUANTITY = 8) IN THE RADIO EQUIPMENT ROOM WITH SIMILAR SPRINKLERS BUT HIGHER TEMPERATURE RATING OF 282 DEGREE FAHRENHEIT. SPRINKLERS SHALL BE U.L. LISTED AND F.M. APPROVED AS MANUFACTURED BY STAR SPRINKLER CORP. MODEL E STANDARD UPRIGHT OR APPROVED EQUAL.

11. HORN

PROVIDE A LIGHTWEIGHT, COMPACT AUDIBLE SIGNAL DEVICE TO PRODUCE 110db AT 10 FEET WITH A WALL TYPE TONE SIGNAL, AS MANUFACTURED BY FEDERAL SIGNAL, MODEL 3000C-120-TM1 OR APPROVED EQUAL.

12. REFRIGERATION PIPING

INSULATE SUCTION PIPING AS PER SPECIFICATION SECTION 15945 ENTITLED "HVAC INSULATION".

12. FIRE DAMPERS:

FIRE DAMPERS SHALL HAVE A 1-1/2" HOUR FIRE RESISTANCE RATING IN ACCORDANCE WITH UL 555 AND MEET NYC LOCAL CODE.
DAMPER SIZE:
70"W x 45"H
72"W x 40"H
28" DIA.

FIRE DAMPER SHALL BE RATED FOR USE IN DYNAMIC SYSTEMS.

BLADE MATERIAL: 24 GAUGE GALVANIZED STEEL, CURTAIN TYPE OUT OF AIR STREAM FOR MINIMUM FLOW AIR RESTRICTION.

FRAME MATERIAL: 4-7/8" WIDE, 20 GAUGE GALVANIZED STEEL CHANNEL.

CLOSURE SPRINGS: 301 STAINLESS STEEL.

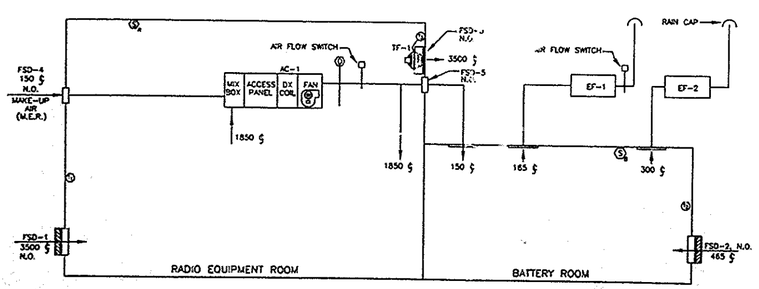
FUSIBLE LINK: 165°F.

FIRE DAMPER SHALL BE RUSKIN MODEL DBD2, STYLE B OR APPROVED EQUAL. VERIFY DAMPER SIZES WITH ACTUAL EXISTING DUCT SIZES IN FIELD. COORDINATE SHUTDOWN OF AIR HANDLING UNITS WITH PORT AUTHORITY ENGINEER INCHARGE OF THE PROJECT.

GENERAL NOTES

1) IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER AN ITEM ON THIS DOCUMENT IN ANY WAY. IF AN ITEM BEARING THE SEAL OF AN ENGINEER IS ALTERED, THE ALTERING ENGINEER SHALL AFFIX HIS SEAL AND THE NOTATION "ALTERED BY" FOLLOWED BY HIS SIGNATURE AND THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

2) REFER TO STRUCTURAL DRAWINGS FOR SEISMIC BRACING AND SUPPORT DETAILS FOR INSTALLATION OF MECHANICAL EQUIPMENT.



AIR FLOW DIAGRAM

AC UNIT SCHEDULE

UNIT #	TOTAL COOLING CAPACITY	SENSIBLE CAPACITY	EVAPORATOR SECTION				COMPRESSOR				POWER	MANUFACTURER AND MODEL	REMARKS
			CFM	ESP	HP	TYPE	NUMBER	TYPE	HP	REFR.	VOLT/PH/HZ		
AC-1	57,600	43,200	2000	0.50"	1.5	BACKWARD CURVED CENTRIFUGAL	1	HIGH EFFICIENCY	5.0	R-22	208/3/60	TEMTROL AIR HANDLER, MODEL C12-42, APPLIED PRODUCTS CONDENSING UNIT, MODEL AUC-0500H2 OR APPROVED EQUAL	LOW AMBIENT OPERATION

BASED ON 95°F AMBIENT TEMPERATURE AT CONDENSER AND 78°F DB/64°F WB ENTERING AIR TEMPERATURE AT DX COIL.

FAN SCHEDULE

FAN #	LOCATION	CFM	TSP	FAN TYPE	HP	RPM	POWER			MANUFACTURER AND MODEL	REMARKS
							VOLT	PHASE	HERTZ		
EF-1	BATTERY ROOM	165	1/4"	CENTRIFUGAL DIRECT DRIVEN	1/4	673	115	1	60	CARNES MODEL VDI4D8L3 OR APPROVED EQUAL	SEE EQUIPMENT NOTE 2
EF-2	BATTERY ROOM	300	3/8"	CENTRIFUGAL DIRECT DRIVEN	1/4	1260	115	1	60	CARNES MODEL VDI4D9L2 OR APPROVED EQUAL	SEE EQUIPMENT NOTE 2
TF-1	RADIO EQUIPMENT ROOM	3500	1/2"	PROPELLER DIRECT DRIVEN	3/4	1725	208	3	60	CARNES MODEL LJD8-18R2 OR APPROVED EQUAL	SEE EQUIPMENT NOTE 3

Sheet 94 of 110

THE PORT AUTHORITY OF NY & NJ

ORIGINAL SIGNED & SEALED BY N.Y. P.E. (OR R.A.)

Ram Communications Consultants, Inc.
10 Woodbridge Center Drive
Woodbridge, NJ 07095
(908) 636-0370 fax (908) 636-7260

I HEREBY CERTIFY THAT THIS IS A TRUE AND CORRECT COPY OF ONE OF THE CONTRACT DRAWINGS CONSTITUTING A PART OF CONTRACT NO. WTC-945.071 IN THE FORM IN WHICH SAID DRAWINGS EXISTED AT THE TIME THE SAID CONTRACT WAS EXECUTED BY THE PARTIES.

DATE 1/16/98 Sullen A. Aslam SPEC WRITER

DATE 4/10/98 P.C. Swamy ENGINEER OF DESIGN

No.	Date	Revision	Approved

The World Trade Center

DR: STANDBY POWER
5 WORLD TRADE CENTER

COMMUNICATIONS

LEGEND, EQUIPMENT NOTES, ABBREVIATIONS AND SCHEDULES

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.

S.C.	R.M.	S.C.
Designed by	Drawn by	Checked by

Date — Scale NONE

Contract Number WTC-945.071 — Drawing Number M-8C1